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ROCKS and MINERALS

A Magazine for Mineralogist, Geologist and Collector . .

. . . . . Official Journal of The Rocks and Minerals Association

. . AUGUST, 1937. .

Vol. 12 No. 8 FIFTEEN CENTS Whole No. 73

ARKANSAS MINERALS

WAVELLITE—A silvery green mineral with radiated structure. Occurs in a gray limestone... 1" 10c; 1½" 15c; 2", 35c; 3", 50c.

NOVACULITE—A very close grained, siliceous, flint like rock, used in the manufacture of whetstones... 1", 10c; 1½", 15c; 2", 20c; 3", 35c.

VARISCITE—Occurs as a brilliant, grass green coating on limestone. Many specimens show tiny bundles of xline aggregates. 1", 10c; 1½", 15c; 2", 30c; 3", 50c.

RUTILE—Nigrine... Black, masses of intergrown xls... 1", 10c; 1½", 20c; 2", 40c.

LODESTONE—While the Arkansas lodestone is not as strong as some others, it is able to hold small brads or tacks... 1", 15c; 1½", 20c; 2", 35c.

Our fall advertising will feature such minerals as Sulvanite, Australia, Dakeite, Wyo.; Wurtzite, Utah; Minium, Australia, etc.

R. W. TUTHILL

110 EARL ROAD **MICHIGAN CITY, IND.**

Rough and Polished Minerals

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Friends who travel tell us that ours is the most notable stock they have seen in the West. Many of the supporters of **Rocks and Minerals magazine** have been our steady customers for years. You too might be pleased with our values and service if you give us an opportunity to demonstrate them. Send a stamp for price lists and circulars, and let's get acquainted.

THE GEM SHOP

ESTABLISHED IN 1919

Box A-797 **Helena, Montana, U. S. A.**

ROCKS and MINERALS

PUBLISHED MONTHLY

Edited and Published by PETER ZODAC

AUGUST ..1937..

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ROCKS and MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

AN IMPORTANT ANNOUNCEMENT

No matter where you live, you no doubt have noticed an upturn in prices on all commodities. This is a direct reflection on a better business era. A few years ago better times were just 'around the corner'. Now we have turned that corner and have gone half-way up the street.

We find that with rising wages and better business conditions that prices of raw materials always keeps a step or two ahead of us. The cost of printing, paper, stationery, and other important publishing items have jumped as high as 50 per cent—thus far outstripping us.

In order to keep the red ink off the books and to maintain for our subscribers the same well-appearing magazine with our usual intensely interesting articles, we are forced to raise both the subscription and advertising rates.

We feel assured that our many loyal subscribers and readers will be in sympathy with our desire to keep ROCKS AND MINERALS the best mineral magazine in the field.

Beginning September 1, 1937, the new rates for ROCKS AND MINERALS will be as follows:

Subscriptions $2.00 a year; sample copy 25c.

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Per column inch	$ 3.50	3-4 page	$30.00
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ROCKS and MINERALS

PUBLISHED MONTHLY

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AUGUST ..1937..

VOL. 12 No. 8 — The Official Journal ROCKS and MINERALS of the ASSOCIATION — WHOLE No. 73

WE COLLECTED MINERALS IN GEORGIA

By ALFRED C. HAWKINS

Author of THE BOOK OF MINERALS

The winter of 1935-36 was a rough one even in the Southern States, and a relatively poor time for mineral collecting. Eventually, however, there came a time when the snow and ice melted away, and we lost no time in trying to make up for the long period of forced hibernation. From our observations in the field it appears that Georgia is quite abundantly supplied with mineral species, and that there are plenty of specimens lying on the surface of the ground to be collected by those who have eyes to see them.

The rocks of Central Georgia are mostly of pre-Cambrian age, and to the ordinary observer they would not seem to be rocks at all, but only more or less loose granular stuff that crumbles in the fingers. It seems that the chemical processes attending the warm, moist conditions of the southeastern United States have caused such decomposition in the granites, schists and gneisses that they are in a more or less incoherent state for depths below ground which may amount to fifty or a hundred feet. The minerals in these rocks, if in individual crystals, have been left without support and have tumbled out to go into the stream beds where they can be collected, like the staurolite crystals of the northern counties, or else have more or less rusted away, like the garnet and pyrite crystals, which practically always seem to have lost their surface color and brilliance. Quartz crystals which originally formed groups have all fallen apart; but on the broken surfaces they exhibit colored phantoms and other internal structures in unexpected ways. Many of the rocks in the northwestern part of the State are in a much fresher condition than those farther south. From such fresh outcrops, commercially important decorative marble and other structural and decorative stones are quarried.

Stone Mountain, fifteen miles east of Atlanta, is composed entirely of a fine grained granite which for some unexplained reason has remained fresh. The mountain itself is an outstanding topographic feature, reaching an elevation of nearly seven hundred feet above the rolling country around it; and the famous Confederate memorial, with its relief-cut figures of massive proportions, is a national shrine. Even in its present uncompleted state it is imposing, and we can but hope that it may be completed some day. The quarries where the granite is obtained are a couple of miles east of the mountain, and are very active, although not very deep. The minerals obtainable there are of several kinds, and new ones occasionally come to light. Tourmaline occurs in good black crystals which often show attractive groupings. An unusual mineral of apparently quite common occurrence is zoisite, a compound quite similar to epidote, which appears as flattened brown and green blades on the sur-

faces of cracks in the rock. There are uranium minerals which are found sometimes. The most interesting mineral of all at this locality is the variety of opal called hyalite, which comes in thin, almost invisible crusts on the rock, and because of the presence of traces of uranium compounds in it, is fluorescent. We never will forget the night trip taken to this locality with the Georgia Mineral Club, when ultraviolet lamps were taken around a large quarry and the hyalite collected with its efficient help. Nor will we forget the glory of the spring sunset, radiating from directly behind the gracefully curving mountain.

Farther east of Stone Mountain, there are milky quartz crystals, many reaching lengths of several inches and nicely terminated, which have weathered out of quartz veins here and there throughout many miles of rolling country. A mile or two south of the mountain we picked up some very good terminated black tourmaline crystals, and others in radiating groups. Thirty miles or so further northeast, there was one cultivated field where pseudomorphs of limonite after pyrite cubes, some of them two inches in diameter, were common. But the garnets had all rusted to masses of brown earth. It might be noted in passing that this section of the country is littered with Indian arrowheads and other interesting instruments, which are made for the most part crudely from milky quartz; but others are more carefully designed from flint of very unusual color combinations, evidently with a plan as to decorative effect.

A trip to Cartersville was very interesting and successful from the mineral collector's standpoint. This vicinity supplies quantities of colored earthy materials in red, yellow, brown and black, which are used for pigments. They are the oxides of iron and manganese resulting from the decomposition of highly mineralized rocks. Even the pebbles in the local gravel are of bright colors and are made up of the more solid portions of the same deposits. But best of all were the highly modified, brilliant little colorless barite crystals which were found by cracking open some rusty looking vein quartz. Such crystals from this locality are famous as a delight for the crystallographer.

At Tate, where the marble is mined, you have views of glorious mountains to the northwest; and the humblest miners' cabins have chimneys of perfectly finished white marble, and perhaps massive marble columns to hold up the porch roof; and along railroad sidings on the hillsides, the faces of lions and all sorts of grotesque figures unexpectedly peer out at you from among the trees. The marble is unusually coarse in grain for the most part; and much of it has delicate pink and salmon colors, or bands of black and green, that make you want to take away at least one specimen of each kind. The big surprise of our trip, however, came when we spied, underneath a car where it had been thrown, a large chunk of marble with a bright emerald-green color, sparkling in the setting sun like something which we had seen before. This piece was full of fuchsite, known as the chrome mica, in which the chrominum which causes the green color is chemically an essential part. Since the time of this discovery we have heard reports that other pieces have been found.

We might be more specific and detailed as to localities, but fear that somebody will go there with a truck next Sunday. So we leave distribution of further information to the discretion of the Geeorgia Mineral Club, that young and active organization which meets in Atlanta every month, at the Central Y. M. C. A. Look them up when in that city and you will be pleased.

DINOSAUR GIZZARD STONES

By W. C. MINOR, Fruita, Colorado

An assortment of dinosaur gizzard stones makes an interesting addition to any mineral collection. The collecting of these stones can, of course, be classed as a branch of general mineral collecting. However, the gizzard stones are so interesting and they come in such a wide variety of colors, shapes and types of stone that several fine large collections consisting solely of them have been made.

For a long time paleontologists were puzzled to account for the small polished stones that are often found scattered among deposits of fossilized dinosaur bones. It is now generally believed by students of the subject that these stones were once swallowed by the dinosaurs and acquired their polish by motion and the action of the gastric fluids while inside the dinosaur's stomach. It is presumed, of course, that the dinosaurs swallowed the stones as an aid to digestion, though it is possible that they were merely attracted by the bright colors. Perhaps Mr. Dinosaur can rightfully be called the world's first collector of colorful rocks and minerals. But, if so, his pleasure must have been derived solely from the finding of his specimens rather than in displaying them to his friends, for he swallowed his collection and carried it around inside!

Gizzard stones, also called gastrolyphs or stomach stones, are usually easily recognized when found. They have a high natural polish and an oily feel rather difficult to describe but quickly recognized by the collector once he has become familar with them. Water polished stones, at least the pebbles found in our western streams, lack this extremely smooth finish. Perhaps the closest thing in appearance to the gizzard stones are beach pebbles that have been polished for ages by the constant pounding of ocean waves. Perfect gizzard stones have this glassy polish on all sides, and presumely all of them were like this at one time. However, many of them are now found in soil that contains alkali or other corrosive chemicals. Such specimens may have one or more sides blemished or roughened by the chemical action of the soil.

In size, dinosaur gizzard stones range from tiny specimens hardly an inch in length and weighing less than an ounce, up to several inches in length and weighing two pounds or more. The largest one the writer ever found was slightly over six inches in length and weighed approximately three pounds. Needless to say specimens as large as this are uncommon.

The wide range of types and colors in which these stones can be had is one reason that makes them attractive to collectors. Rarely are any two gizzard stones found that are exactly alike either in size, shape or color. The writer has found gizzard stones of flint, quartz, chalcedony, agate, jasper, granite, gneiss, etc. Apparently any hard, fine grained stone was suitable for Mr. Dinosaur's purpose. But if he ever swallowed the soft sandstones and shales they have doubtless weathered away ages ago.

Occasionally gizzard stones are found in dull, unattractive shades of gray, brown or black, but most of them run more to the brighter colors. Some are strikingly mottled, spotted and banded with contrasting colors. These latter are very attractive specimens indeed and are highly prized by collectors.

Many mineral collectors would like to have more polished specimens in their collections, but do not feel justified in going to the expense of having many of their specimens polished. For such collectors dinosaur gizzard stones can be strongly recommended.

The bones of dinosaurs, and usually gizzard stones, are found in many regions throughout the west. The writer has specimens from a number of different localities in western Colorado and eastern Utah. The first gizzard stones he ever found, some eighteen years ago, were on Dinosaur Hill two miles south of Fruita, Colorado. Incidentally, it was from this same Dinosaur Hill that the fossilized bones of the huge, eighty feet in length, dinosaur, now on display in the Field Museum in Chicago, were taken. The road south from Fruita to the Colorado National Monument and the Redlands crosses the Colorado River on the Fruita bridge at the foot of Dinosaur Hill and then loops around the north and east sides of the hill in a semi-circle. This locality, so near a town and right on a road, has of course, been pretty thoroughly picked over. But good specimens are still occasionally found here.

Other good localities where specimens are still plentiful are the hills north of the Colorado River about five miles south of Cisco, Utah. When looking for dinosaurian material in this region the most likely places to hunt are the beds of Devonian clays and shales. These shale and clay deposits, red-brown and gray-green in color, are exposed to view on many of the low hills along both sides of the Colorado River in this section of eastern Utah and western Colorado. To be sure, not every colorful clay hill or gully that you find will yield collectable specimens. However, a good many of them will.

No article about dinosaurs in this region would be complete without some mention of the famous Dinosaur National Monument near Jensen, Utah. Of course, collecting is not permitted within the boundaries of the monument but it is a place well-worth visiting. In places the fossilized bones have been partly uncovered so that visitors may view the remains of these prehistoric monsters just as they are when found.

Of all the localities that the writer has visited his favorite collecting grounds are the breaks of Black Ridge. Black Ridge itself is a high, narrow mesa several miles in length extending east and west between the Grand Valley and Glade Park in western Colorado. The Ridge slopes off steeply on either side and in several places on these abrupt slopes, or breaks, deep gulches have eroded down into beds of the Devonian clays. It is in these exposed clay beds that most of the fossil bones and gizzard stones are found. This is a rather inaccessible region. The closest one can approach with a car, either from the Grand Valley on the north or Glade Park on the south still leaves a hike of several rugged miles to reach the more interesting spots. So for those who do not go in for mountain climbing a la rock lizzard this will very likely remain unexplored territory for a long time to come.

Recently, while the writer was prowling around the breaks in search of specimens, he blundered into one of these deep gullies that he had not seen before. He promptly named the place Dinosaur Gulch because of the unusual number and variety of fossil bones scattered about. These bones, it must be understood, are all broken. The pieces range in size from tiny fragments up to as much as 100 pounds. The finding of whole or unbroken bones is such a rare occurrence as to be practically unheard of in this region It is strange what Time and Mother Nature can do when they start out to petrify such an ordinarily unattractive material as old bones. Some of the fossilized bone is grayish white in color, much like the original bone. Others are brown, red, black and almost purple, hard as flint and are good cutting stones. In still other specimens the cartilage of the bone has been replaced with red jasper, sometimes solid jasper and sometimes the bone part will be jasperized while the marrow is replaced with quartz crystal. There is another type, though somewhat rarer, identical with the

red jasper specimens, only it is black instead of red. Agatized bone, though rare in this section, is occasionally found. The writer has one specimen, some ten pounds in weight, which consists mainly of red jasper, the outside of the specimen is gray, like the original bone, while the center, or marrow, has been replaced with beautifully colored red, purple, blue and gray moss agate

One of the largest pieces of fossilized bone found in Dinosaur Gulch measured roughly six inches thick, eighteen inches wide and twelve inches in length, and weighed approximately 100 pounds It was the end of a flat like bone, presumably a rib bone. Not being a paleontologist, the writer is not qualified to make even a wild guess as to what species of dinosaur this bone was once a part of. But to judge from the size of this one fragment, it must have been an immense beast indeed. This specimen is of the black jasper type with the marrow of grayish quartz crystal. Yes, indeed, a specimen to arouse the enthusiasm of any rock hound, whether his chief interest is minerals or fossils. And also, yes it is still there. The writer, not having a pack horse along, did not feel called upon to "tote" it out on his back over ten miles of typical canyon country, much as he would like to have added it to his collection. He did, however, condescend to pack out twenty pounds of nice gizzard stones from this same locality.

MINERALOGICAL SOCIETY OF SPRINGFIELD OUTING

By D. S. BROWNELL

On Sunday, May 23rd, the Mineralogical Society of Springfield, Vermont, in co-operation with the 5th National Outing of the Rocks and Minerals Association, made a field trip to the fluorite quarry at Westmoreland, N. H. The quarry has not been worked lately but we were successful in collecting a number of fine specimens of fluorite, of good color, including some crystals. Some of the specimens contained pyrite; others appeared to be coated by malachite.

Though the day at first was ideal for collecting the sky in the northeast became darker and darker and we were forced to leave, getting home just before the series of thunderstorms broke into action.

On Sunday, May 23rd, nine members of the Explorer Patrol of Scout Mineralgists, Stamford, Conn., visited the feldspar quarries at Bedford, N. Y., in co-operation with the Rocks and Minerals Association 5th National Outing.

We stopped first at the new quarry and the following specimens were collected: A couple of fine microcline crystals having good terminations; quite a few specimens of muscovite with magnetite inclusions showing definite forms of crystallizations; a fine group of rock crystals; good specimens of morion, albite and opalescent quartz.

The writer observed in a pocket of reddish feldspar what appeared to be the silky fibrous structure of malachite. This proved upon examination to be a variety of moss; the pocket was completely lined by the moss to a depth of at least six inches.

At the old quarries nothing of importance were collected except several compact specimens of biotite.

Although a heavy thunder shower marred our return home in the late afternoon, we all had a perfect day at the quarries.

EXCHANGING

By PAUL McGUIRE

Having made hundreds of satisfactory exchanges and a few that were not, I am giving some impressions and rules for the benefit of those who might also wish to enjoy the pleasure of this pastime which is a part and parcel of every collector's hobby.

First, it takes time, money and material to follow this hobby. The time should be spent in writing descriptions of your material, both before and when you send it out. A rock is just a rock unless it is correctly named and labelled and if you send some information about it, the recipient will not have to do a lot of research that you have already done.

Money is necessary for postage and express and to buy collector's items if you cannot find them in the field. You cannot give value for value and make 89c postage at the same time. To swap something you don't need for something you want very much should be worth the difference that is spent on postage. This is taken into consideration by both parties. At the same time the cost of postage enters into the value of what is sent or received. A dollar's worth of desirable minerals may require a dollar's worth of postage while a five dollar gem or picture may only require 9c, so some allowance for the cash outlay is necessary. Again, many times by buying something for a collector that he wants you can get something what you want in exchange. A stamp collector may have fossils to trade only for stamps. Many successful swappers buy all of their material. A person in average circumstances cannot exchange successfully unless he has access to material that can be procured at little cost. Plenty of fossils, a vein of good minerals, mine dumps to cull over old Indian camp sites second-hand book stores to browse through, bankrupt stock for odds and ends, and so on, are sources of supplies.

There are three kinds of exchangers: those who trade for pleasure; those who trade for profit; and those who do not know what or why they trade. These facts are for those who exchange to help some other collector; to enlarge their own collections; and who would rather be gyped themselves than to cheat someone. If you want to trade with a dealer, allow him his profit. If you can't do that, don't trade because he has to pay rent, overhead, advertising, etc. Dealers seldom trade among themselves and seldom care to trade with anyone who knows little of business demands. Judge carefully as you can whom you are trading with and what kind of a deal you can expect. Don't send a lot of valuable material to someone whom you feel sure does not have much to send you. Don't send trash or worthless stuff to anyone. Don't try to trade exactly even with students or beginners for you are sure to disappoint them. You can always add a few extra specimens to cover what they are out for postage. Don't ever hope to get something for nothing. If you do get this, you have cheated someone and chances are that you will eventually get hooked and suffer for your greed. If you believe a certain specimen to be valuable, state so before sending it. Don't trade material of unknown value and don't try to trade for material of fantastic or extreme value. Don't think that because anything is old it must be priceless — this includes stamps, books, antiques, gems, and a lot of other things. Rarity is value, not age.

Pack carefully. This means about twice as good as you think necessary. Specimens rubbed and scratched in the mails are damaged. If they wear a hole in the box and loose out, it's your loss and not the other fellow's.

Remember that cast iron, automobile parts, and other heavy material may be in the same bag with your package. I have received fragile shells through the mail, wrapped in old newspaper, and I hated to tell the sender that what was received was just a mess of fragments.

Don't send good money after bad. If you get no value the first time you trade with a collector, forget it; don't try to get even. If you get fair value, arrange another swap. I have exchanged 8 or 10 times with several collectors. We send anything we get that we know will be of interest to the others and wait until they find something of interest for us. Be prompt in making returns. Nothing takes the kick out of an exchange like having to wait a couple of months for your share of the deal. If you get something you can't use, don't crab or discount it entirely but lay it aside and re-exchange it with someone who will appreciate it.

Collections often grow amazingly fast. The dub today may be your equal tomorrow, especially if he has access to a good library and a big museum. And he may be able to help you out in a big way. If you decline a trade or a second one, do it gracefully and with consideration. Next year you may be glad to try again.

If you really want to make an exchange, state what you most prefer, certain specific items, then what you are interested in to a lesser extent, in your correspondence with collectors. If you have plenty of duplicate material why not trade it for some textbooks or other things if certain minerals are not to be had. Be careful and truthful about your own material.

The aim of every swapper is to get into the "Inner Circle." Instead of continually hunting for collectors to trade with, they will write you requesting a trade How do they do it? I have had some parties recommended to me dozens of times by collectors in the most widely separated places. First, they are always willing to trade and give good values. Secondly, their friends unhesitatingly can recommend them. Maybe they trade once, maybe a dozen times, but always with good results.

For good reasons, many collectors are bitter against trading. If you are not inherently honest and generous as well, leave trading alone. If it hurts to send someone 40c worth of material and receive nothing in exchange, don't begin. Beginner's luck here is all bad, it seems. I traded two dozen times before I found one worth while. Now I know why. The fault was mostly mine. Don't try to make it pay its own way. If one fellow lets you down, don't take it out on the next one A list of sizes, quality and value is also helpful in trading.

I find it is more blessed and profitable to give than to receive. Therefore I ship first if I think the other collector can give value. The honest person is more apt to undervalue than overvalue his material that the other fellow really wants. You should know whether or not your material is desirable. Poor material goes at a big discount anywhere. Try to visit other collectors and see what is really desirable.

REPORT OF THE COMMITTEE ON THE MEASUREMENT OF GEOLOGIC TIME.

Alfred C. Lane, Chairman; John Putnam Marble, Vice-Chairman. There are many methods of measuring geologic time but the methods adopted by the committee are now generally accepted and the results used. Presented at the Annual Meeting of the Division of Geology and Geography, National Research Council, 2101 Constitution Ave., Washington, D. C., May 1, 1937, 77 pages.

PYROMORPHITE AT THE BROOKDALE LEAD MINE

By THOMAS J. LEWIS

Sometime after "Reminiscent" was published in the February, 1934 number of **Rocks and Minerals.** I received a letter from Mr. David Williams of Yeadon, Pa., saying "I want to thank you for your article on Williams Corner as I have for the past month taken some very beautiful specimens from the locality. The Pyromorphite I secured were of all the varieties described, the specimens ranging in size from 2"x2" to 8"x8".

We later made a trip to the Brookdale Mine (in the eastern part of Chester Co., Penn.) which did not pan out very well and Dave was greatly disappointed on my account but, as I secured several choice mounts and enjoyed the days outing, I was well pleased with the trip.

Acting on Dave's tip, I again visited the mine in the Spring of 1935, also September 10th and 26th and October 29th, 1935, and put in four hours hard work each day, securing a lot of material which after washing gave me thirty or forty very attractive cabinet specmens of Pyromorphite, a number of which were fairly showy specimens, and added about fifty gems to my micromount collection of Pyromorphite of various forms and colors, Cerussites, several forms, Anglesite, Wulfenite, Stolzite, Quartz and Quartz enclosing Galenite.

Below is a descriptive list of Micromounts of Pyromorphite secured

1—Perfect hexagonal prisms with basal plane.
2—Hexagonal prisms with basal plane truncated forming a zone of new faces at 45 degrees to the prism.
3—Truncated prisms distinctly banded.
4—Prismatic crystals in parallel groups.
5—Rosettes of diverging prisms with basal planes.
6—Prisms, singles and rosettes terminated with six sided pyramids.
7—Prisms terminated with hollow crown (prism faces extending beyond the centre).
8—Prisms terminated with an irregular battlement, "some up, some down."
9—Prisms having a cap coming down over the prism 1-3 way forming a capped crystal (the cap is Mimetite) (Genth).
1-0—Prisms terminated with silky fibres.
11—Prisms terminated with many diverging crystals like a palm tree.
12—Slender crystals tapering to a sharp point.
13—Prismatic crystals with shoulder forming a bottle neck.

Barrel Forms.

14—Fish tails, slender crystals slightly swollen in centre, terminated with two crossed pointed crystals.
15—Slender barrel shapes with sharp pointed terminals from these the barrel shapes continue to swell until they reach the dumpy pineapple shape.
16—Again beginning with the fish tails we have the bursting terminals of ribbed crystals the tops of which form a dozen or more seperate xls, odd but interesting mounts very much like a pineapple with leafy top.

Again we have a total elimination of the prism or barrel and a mushroom of terminals instead.

Another form is a barrel shingled with imbedded terminals from base to tip, much like a bagworm cocoon.

Most prisms are transparent and range in color from dark bottle green through greens to yellows, to golden yellow, thence to gray and white opaque. One group has a white porcelain like opaque coating.

The barrel shapes are mostly opaque and may be Mimetite, but as the Pyromorphite has the same forms, I have classed them under the one head, as it is difficult to distinguish

where the line of demarcation begins in these two minerals, though both Genth and Dana claim the caps on the prisms are Mimetite. There is a larger percentage of barrel crystals and pyramidal terminations at Brookdale than at all the other Chester County mines.

Wulfenite; several mounts show this mineral in prismatic crystals with acute octahedral pyramids of a deep red color, also a few yellows:

Cerussite; white and black prisms, short crystals with many faces and a few butterfly twins and long slender white needles in parallel position.

Anglesite; long slender tapering four-sided crystals colorless and transparent usually associated with an altered galenite.

Stolzite in bright beautiful yellow crystals on a Quartz matrix.

Many cabinet specimens were obtained in good crystal coatings on Quartz, both yellow and green. The bright green Pyromorphite sprinkled on the small white Quartz crystals are very attractive.

One specimen showing several hundred micro-crystals of Stolzite, sharp and well defined, of a beautiful yellow color on a Quartz matrix, 2½x2½ was secured which would make some choice mounts but, as the crystals are visible to the naked eye, it will remain in the cabinet.

If you go to the Brookdale Mine, be prepared to work and work hard as this mine has not been worked for over forty years. The specimens are dirty and have to be washed with spray and brush but they pay for the labor expended both for the cabinet and microscope. Cabinet specimens of any but Pyromorphite are rare.

Finally—this mine is on a cattle range and all holes must be filled, that there be no crippled animals.

"Here's How."

With Phoenixville as a base, out Starr Street to Nutts Avenue, left to White Horse Road. Right or south to Pickering Creek, cross creek. Right along creek to Private Road (about 250 yards), left to Brookdale Mine (about 1-3 mile) and I wish you success.

Editor's Note:—The Brookdale Mine is one of three abandoned lead mines, known as the Wheatley Mines, in the eastern part of Chester County, which in turn is in the southeastern part of Pennsylvania.

A TRAGIC ACCIDENT

Just as we were going to press, word reached us of the tragic death by drowning of Mr. & Mrs. Edward Wales and daughters Estherruth and Priscilla of Auburndale, Mass., about 7:00 A. M. Thursday, July 8th. While on a tour through Canada, and near Calgary, Alberta, their car hit a depression in the road, bounced out of control, crashed through the guard rail of a bridge and fell 30 feet into water below. Eleanor, another daughter, was miraculously saved.

The Wales were warm friends of Rocks & Minerals, members of the Association, and their tragic death was a severe shock to the Editor who knew them personally. Our heartfelt sympathy is extended Miss Eleanor in this hour of her very deep sorrow.

GEORGE B. GOODWIN
Glacial Pebbles
Selected Minerals
617 North Broadway
Milwaukee, Wisconsin

THE MICRO DETERMINATION OF MINERALS

by EUGENE W. BLANK

Recently the writer presented methods in this Journal for the determination of the streak of a mineral (1) and its hardness (2). In these two papers emphasis was laid on the fact that the mineral received little if any disfigurement discernible to the naked eye due to the very short scratch (approx. 1/50 inch) involved in the test.

Conversely due to the very short scratch necessary to make the test it is possible to work on quite small pieces of mineral material right down to fragments and even individual grains as in the case of coarse sands, etc.

In the course of the above experimentation the writer became interested in the examination and possible determination of the composition of very small metallic fragments. It is often desirable to have at hand a procedure whereby it is possible to identify very small particles of mineral matter. Particularly is this true in the case of the rare element minerals which are often found only in small quantities. The following paper describes a procedure for the examination of small mineral fragments which has been developed by the writer and which while manifestly tentative in many respects has proven itself of sufficient value to merit publication.

A—Determination of Physical Properties by Tests That Do Not Distort or Destroy the Original Condition of the Specimen.

1. **Preparation of the Sample: —** Assume for example that a very small fragment of mineral about 2x2x1 mm. is to be examined and possibly identified. The remarks which follow also pertain to larger samples but in the latter case the procedure is enormously simplified and many logical shortcuts will present themselves in the course of the work.

First examine the fragment on a clean sheet of paper under a low power lens. With a sharpened orangewood stick (or any convenient, pointed, non-metallic object) brush or break off any loose particles of dirt which may be present. It will be necessary to hold the particle meanwhile with the aid of another stick. If it is not desired to proceed immediately with the examination of the specimen carefully transfer it to a small vial about 2x½ cm. and stopper with a clean, sound cork.

2. **Determination of Physical Properties by Direct Observation Using the Low Power:**—Examine the specimen under a low power microscope or hand lens using a clean sheet of white paper as a background. Observe as many of the following characteristics as possible and record the information. Many of the following properties are self explanatory. For further details see a good textbook of mineralogy.

(a) Luster.

(b) Color. Note particularly any play or change of color as the fragment is rolled around.

(c) Tarnish. Differences in color between the mass of the material and any fresh fractures should be noted.

(d) Transparency or diaphaneity.

(e) Odor. This test is of limited value. Place the fragment in a small, clean, odorless vial stoppered with a clean cork and allow to remain for 24 hours or more. Remove the stopper and place the vial to the nostrils.

(f) Radioactivity. If suspected place the particle on a photographic plate or film and allow to remain 48 hours before developing in the usual manner.

(g) Phosphorescence Expose to a source of ultra-violet radiation.

3. **Determination of Physical Properties by Specific Tests:—**

(a) Specific Gravity: — Numerous methods exist for the determination of the specific gravity of small particles of material. A brief bibliography will be found in one of the writer's papers (3).

Probably the simplest and most convenient method is that of Graham (4). The method consists of placing the fragment of mineral in a small test tube with Methylene Iodide and several standards which consist of small fragments of minerals of varying density. A small stirrer should also be inserted in the tube. Carefully add Carbon Tetrachloride to the Methylene Iodide with stirring until the mineral fragment under examination is exactly suspended in the mixture and shows no tendency to rise or sink. Note which standard is also suspended or nearly so. The mineral fragment will have a density equal to that of the standard. If the fragment is suspended between two of the standards as the Carbon Tetrachloride is slowly added it has a density midway between that of the standards.

For those having access to a laboratory the method can be made more exact by always using the same volume of Methylene Iodide in the test tube and adding the Carbon Tetrachloride from a buret. Previously plot the buret readings against known densities of standards. The density of the specimen is found from the point at which its buret reading cuts the plotted curve. By cooling the mixture to 5° C. or less the Methylene Iodide can be recovered.

(b) Magnetic Properties: — The magnetic properties of microscopic particles may be readily recognized by bringing a small bar magnet in proximity to them. A magnetized needle or an electromagnet composed of a short piece of thin iron wire may be employed. The use of the latter presents the difficulty that the particle itself becomes magnetized and adheres tenaciously to the magnet. The difficulty can be obviated by enclosing the electromagnet in glass (5).

(c) Index of Refraction:—This is a simple determination and is described in all the textbooks. The fortunate possessor of a microscope is probably already familiar with the test.

(d) Streak: — This determination has recently been described in "Rocks and Minerals," (1). In the case of small fragments of material it is convenient to mount them on a heavy piece of glass by means of Canada Balsam in order to hold them securely during the Streak and Hardness test. The fragment can be subsequently removed from the glass by means of alcohol. It is perhaps needless to point out that the streak plate itself, i.e., the porcelain point, should be kept if chemical work is to be done later on since the streak material adhering to the point can be dissolved and utilized in the chemical tests.

(e) Hardness:—This determination has also been published in a recent issue of "Rocks and Minerals" (2).

B—Determination of Physical Properties by Tests That Distort or Destroy the Original Condition of the specimen.

1. **Cleavage:**—If the fragment is large enough press on it with a short bladed knife. Any planes along which separation takes place are cleavage planes.

2. **Taste (Solubility):** — Place the fragment on a clean microscope slide and add several drops of water. If the mineral dissolves, cautiously taste a small drop of the solution. Preserve the remainder of the solution for chemical examination.

C—Determination of Chemical Properties.

It is not the purpose of this paper to describe the chemical examination of micro quantities of material. Sufficient to say that great progress has been made in this field in the past two decades. While it is desirable that the determination of the mineral from its physical properties as already described should be confirmed by chemical means it is not absolutely essential and most times should only serve as a further confirmation. The cases in which two or more minerals both fit the same set of physical properties as determined are rather

rare but in this unfortunate event chemical treatment will be required. Probably the most popular source of information for the chemical examination is Chamot and Mason (6). Emich (7) will also be found of considerable value if one is able to read German.

D—Practical Examples in the Use of the Procedure.

Example 1:

A small fragment of mineral had a metallic luster. The streak was determined and found to be bright red. The hardness was found to be approximately 6. The specific gravity was above 3.3 (Methylene Iodide—3.32). The mineral was magnetic. By use of mineral tables (8) the mineral was found to be Hematite. Chemical tests confirmed this deduction.

Example 2:

A thin grayish fiber was examined. The luster was vitreous. The streak was colorless. The hardness parallel to the long direction was about 4.5. The specific gravity was approximately 3.3.

Cyanite was suspected. The hardness was tested at right angles to the long direction of the fiber and found to be much greater than 4.5. The fiber was judged to be Cyanite.

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(1) E. W. Blank, "Micro-Method for Determining the Streak of Minerals," Rocks and Minerals, 12, 88 (1937).

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(4) R. P. D. Graham, "Determination of Specific Gravity of Mineral Fragments by Heavy Liquids," Trans. Roy. Soc. Canada, 11, 51 (1917).

(5) E. W. Blank, "Separation of Magnetic Particles Under the Microscope," J. Chem. Educ., 14, 33 (1937).

(6) E. M. Chamot and C. W. Mason, "Handbook of Chemical Microscopy," 2 Vol., John Wiley & Sons, Inc., New York (1930).

(7) F. Emich, "Lehrbuch der Mikrochemie," 2nd Edition, Bergmann, Munchen (1926).

(8) Kraus, Hunt and Ramsdell, "Mineralogy," 3rd Edition, pages 454-621, McGraw-Hill Book Co., Inc., New York (1936).

A NEW GARMENT HANGER

Those of our readers who may have occasion to hang garments out to air may recall how often such garments were found lying on the ground — possibly even in mud. To overcome this annoyance, one of our members, Mr. Robert W. Taylor of 159 Wells Street, Peekskill, N. Y., has devised, patented and placed on the market a new garment hanger. The hanger is so constructed that it encircles the clothes line and will not fall off regardless how windy is the day — nor will it slip on an inclined line. Furthermore, the hanger is also adapted for inside use.

Here is a hanger that is satisfactory in every way. You should have some for your personal use. They also make nice gifts for ladies. Order a supply direct from Mr. Taylor. 3 for 50c, 7 for $1.00.

NOTICED AT THE FIFTH ANNUAL OUTING

Metropolitan Area, Strickland Quarry, Portland, Conn.

By R. EMMET DOHERTY, Pres. R. & M. Assoc.

Otto F. Pfordte of Cariro, N. Y., 82 years old and undoubtedly the oldest mineral collector in existence, was present and accounted for in the company of jovial Carl and Alice Klein of Hudson, N. Y. Mr. Pfordte has traveled the world over since 1876 in the quest of fine minerals.

Ernest Marshall, James C. Moore and son, James B., and several young fellows from Bridgeport, Conn., busy slaying a lemonade jug filled with ice cubes.

President Doherty arrives at Editor Zodac's home on Sunday morning in time to see Dr. John R. Evers of Tarrytown, N. Y., hauling said editor from bed with a very bad headcold. The good Doc placed a few new parts in ye editor and kept him running for the rest of the day.

How well John Kitson, director of the Massachusetts division looked in his spruce khaki uniform.

The Schortmann brothers and wives from Easthampton, Mass., enjoying the weather in an open roadster.

John Vlismas, the Stone Craftsman from New York City, with a smile for everyone, signing up for another year with Rocks and Minerals.

Mr. and Mrs. J. A. Ryan of Torrington, Conn., went on the rocks, hammer and chisel.

Mr. Fred Turner of Willimantic, Conn., showed some of the most amazing cabochons, 2½x2 inches, cut and polished entirely by hand!

Henry G. Savage and party of Leominster, Mass. Mr. Savage is a most ardent collector. I ran into him at Chester, Vt., Westmorland, N. H. and now at Portland, Conn. He certainly haunts places.

Professor B. M. Shaub of Smith College, gave an interesting lecture on the minerals of the Strickland Quarry. He had a large and most appreciative audience.

Mr. George E. Forbush was overheard inquiring where the best aquamarine was found at Strickland.

Dr. Alonzo Quinn of the Geology department of Brown University, was always handy when someone was stuck for an identification. He was director of the Rhode Island division.

Peter Zodac talked from the bottom of his boots because of his cold.

Mr. Newton Harris of Croton-on-Hudson, wiped his brow and wondered if the day was warm or if he had been working hard.

Curt G. Segeler photographed his girl companion standing in the glacial groove.

One party had two trays of ice cubes from a refrigerator. Although I looked in their car I could not locate the refrigerator.

Mr. John H. Brodrick of Clinton, Mass., showed a box filled with the finest polished chiastolites these old eyes ever looked upon.

There were a surprising number of requests for autographed copies of the May issue of Rocks and Minerals. Autographs by Peter Zodac and R. Emmet Doherty, B. T. N. (Busy taking notes).

An ancient man was noted toiling up the glory road with a mighty jug of water on his shoulder.

Favorite conversation: "I have found very fine minerals here in the past, this time I came to renew acquaintances rather than collect."

The warning not to start an avalanche was well heeded. Only two slight tremors recorded.

No injuries or minor casualties reported.

Mr. S. A. Montague had the roads well posted with direction signs even though he was absent due to illness. His kindness was appreciated by all and his absence was regretted more than he will ever know. Mr. Montague is an official of the Huse-Liberty Mica Mining and Milling Co.

The man in charge of sunshine delivered his full quota as per contract. About six o'clock someone knocked over a rain bucket up above and the water came down practically in one piece, but too late to spoil the outing.

A remarkable co-incidence, between 350 and 400 people seemed to have found the recipe for happiness.

A smoker tossed down a match and started a small fire in the dry leaves. One of the hot embers rose in the air landing on the back of Mrs. C. H. Klein's neck. Mrs. Klein thought it was a bee, and what she said goes down among the words of the immortals.

The roads around the quarry were jammed with cars, most of them not more than a year old. It seems that no one crocheted a runningboard or hemstitched a fender although there were many large boulders handy.

While peering over the shoulder of a well-known mineralogist, he was observed to wince as he smartly rapped his thumb and did thereupon call on a certain deity to condemn to lower regions a loose hammer handle.

While Professor Shaub was delivering his talk many of his listeners literally papered the hillside on the opposite side of the road. Others, especially young men, were perched on a small shed, in trees, and on top of rocks and looked very much like a great nest of wise owls.

Some fine specimens were found during the day, but nothing to amaze the scientific world.

Mr. Floyd Faux of Bethlehem, Pa., arrived with a party of friends from Pa. 260 miles away. They made a stop at Hudson, N. Y., on Saturday night and went looking for selenites in the famous clay banks at 11 p. m. by flashlight. They dug 18 inches down under the surface and uncovered some fine crystals of the fluorescent and phosphorescent selenite. This flashlight tour should stand out as the height of something or other. When they arrived at the National Outing the next day said Mr. Faux: "I thought I'd bring a few of the boys along to help swell the crowd." The boys ranged from 30 to 70 years of age, the oldest being Mr. George Gehman who has never missed an annual outing. If all the members of the association followed Mr. Faux' example the association would have to hold next year's outing in Yellowstone National Park for elbow room.

The bus load of geology students under the guidance of Dr. Daniel T. O'Connell, C. C. N. Y., New York City, climbed up the hill to the highest pinacle and stopped alongside of one of the most prolific waste piles. That's what service means.

The Rocks and Minerals Association certainly is a fine big fraternity. More back-slapping, hand-shaking and hat-tipping was done that Sunday than the night before a national election.

One addle-pated fidget demanded to know where the shad-flys were, as he had been bitten other years and missed them this year.

Many expressed a desire for an outing every week during the summer. Shades of Dana!

Many good looking girls were present attired in shorts and other smart accessories for the occasion.

Mr. Fred Strickland, owner of the quarry, was present to see that every one was having a good time.

It was a pleasure to see Charles S. Frary, Jr., his brother and his mother of Newton Highlands, Mass. They had made a special trip to the quarry in order to meet the editor.

Mr. G. Davis Chase, Jr., president

of the New Britain, Conn., Mineral Club, was on hand to guide collectors to nearby quarries. The services of Mr. Chase and that of his many assistants were deeply appreciated.

Dr. Joe Webb Peoples of Wesleyan University, proved to be the people's friend in keeping the University Museum open for their benefit.

Many collectors arrived on Saturday, making for them a two days' outing.

Harry and Charles Grahl, brothers from New York City, expressed a desire to re-visit the quarry in the near future. The quarry seemed to fascinate them.

Dr. Arthur S. Knox of Tufts College, and Dr. Frank A. Ferguson of Conn. State College, helped to swell the list of educators present.

Mr. and Mrs. Wm. Otersen and Mr. Charles M. Thomas were among some of the members present from the New Haven Mineral Club.

John A. Higgs, president of the Boston Mineral Club, were very active during the day. A large delegation of club members were also present.

Philadelphia, Pa., was well represented by Dr. and Mrs. W. H. Thomas.

Strickland Quarry was of special interested to Dr. J. R. Evers as it was locality to which he made his first collecting trip. The previous trip was so successful that it was one of the factors which helped build up his very fine collection. He deeply regretted that Mrs. Evers could not attend the National Outing, a feeling shared by many of her friends.

Among some of the many notable who passed before the writer's eyes were: Hugh Albee of Orange, Mass.; Mrs. Carl Wickmann of Pittsfield, Mass.; Frank D. Clark, Derby, Conn.; Miss Hildur Anderson, B. R. Foote, A. H. Harris, A. Martin Hillery of Hartford, Conn.; Miss Priscilla Taylor of New Haven, Conn.; Miss Violet Miller and her parents, Mr. and Mrs. John Miller of Brooklyn, N. Y.; Miss Helen Wright, Miss Gertrude Schmidt, Mr. D. D. Stevens and daughter of Castle Point, N. Y., and Mr. Jay L. Smith of Chester, N. Y.

A subscriber has made the suggestion that **Rocks and Minerals** devote a page, now and then, to jokes and funny tales on mineralogical subjects. Who are in favor of this? Who will co-operate?

Why is it that many collectors, when describing a series of minerals from a locality, do not list them alphabetically?

A new variety of serpentine has been recently found at Tilly Foster, N. Y., and may be described in an early issue of **Rocks and Minerals.**

Some very fine xled celestites has been found in central New York but the locality is being kept a secret.

Golden calcites, xled and very beautiful, has been found in a trap rock quarry ot southeastern New York.

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BADE MYERS BON VOYAGE

Mr. and Mrs. Richmond E. Myers, sailed from New York City Friday, June 18th at midnight, on the Europa for Europe where Mr. Myers will represent the Rocks and Minerals Association at the 18th International Geological Congress to be held at Moscow, Russia, July 20th to 29th.

Mr. and Mrs. R. Emmet Doherty and Peter Zodac were on board to bid the travelers bon voyage.

CANON CITY GEOLOGY CLUB COOPERATES WITH THE R. & M. A. 5th NATIONAL OUTING

By F. C. KESSLER

Our party of 26 drove to the fossil beds in Garden Park, north of Canon City, Sunday, May 23rd, where the Colorado Museum of Natural History was preparing for shipment a dinosaur that our geology club recently discovered and excavated. In the vicinity, members of the party found six gastroliths, some of which had an unusually fine polish and attractive color. One found by Allan Hance was of rose quartz. None of that material has been found here before. Two of black quartzite, bearing veins of white feldspar, were found by Miss Kansgen, Professor of Geology at Western State College and by Harriet White, respectively. Helen Pauls, Betty Sullivan and Genevieve Campbell each found a gastrolith of a rich olive and maroon color, the rock content probably being a pseudomorph of some kind.

On Felch Creek at the contact of the Colorado Redbeds and Dakota formations, an hour was spent quarrying geodes that contain several minerals. Miss Martha Logan, instructor in the Canon City schools, found a pea-green calcite crystal encased in chalcedony and calcite. The cavity was about 2 inches across, lined with sparkling, quartz-like crystallization.

At another point on Felch Creek, some time was spent selecting specimens of pink alabaster for carving into bookends, ash trays, or "bird baths." Mr. Rice, chemistry instructor in the local high school, returned from a short side trip with gray mottled alabaster containing imbedded small crystals of selenite.

"Come and get it," called the ladies of the party at Alkali Gap where they had prepared a picnic lunch while the men quarried plant fossils in the Upper Dakota sandstone. After lunch all went to the quarry and tuned up with chisel and hammer. Finally each member filled the quota of specimens that could be hauled home with fossil foliage that grew here ages ago in a semi-tropical climate.

One ericolon blossom was found, the nearest relative of which now is in far off Brazil, a large viburnum leaf, was taken and one magnolia in a good state of preservation. Dozens of fragmentary leaves and stems were found, in fact, the floor of the quarry was left covered with fragments that will sometime in the future be picked up by other parties who probably will have no tools with them to work out the better specimens. Then they, too, will go home convinced that there really are sermons in stones.

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CLEVELAND MINERALOGICAL SOCIETY HAS BIG OUTING

By ROBERT H. LONG
Secretary, Cleveland Mineralogical Society

A party of forty-two members and friends of the Cleveland Mineralogical Society left Cleveland at 8:30 a. m. May 23, 1937, and traveled by auto 105 miles to Clay Center, Ohio. Mr. George C. Whitaker, President of the Society and leader of the group, led the procession down into the quarries of the Kelly Island Lime and Transport Co., located on the northwest edge of the town. The party then separated to search the various parts of the pit for minerals.

The rock of the quarry is a slightly dolomitic limestone which lies about 10 feet below the surface soil and the pit is mined to the ground water level. At various points along the walls of the quarry are cavities ranging in size from caves large enough to admit an adult to small vugs the size of a finger-tip; here are found the fine specimens for which this locality is noted.

From a standpoint of quantity, celestite ranks first. Excellent clear and bluish tabular crystals with terminations were obtained by many of the group. Fluorite and scalenohedral calcite (dogtooth spar) crystals share second place for frequency. The fluorite varies in color from a pale amber to a deep brown and fluoresces a bright milky green under ultra violet light of any wave length. Good cubes of this mineral were found. The west wall yielded the best bi-pyramids of calcite as well as specimens entirely incrusted with small scalenohedra.

Several of the lucky members' efforts were rewarded with the finding of pieces containing marcasite and sphalerite which are comparatively rare. No galena was found although it is known to exist at this locality.

Of interest to paleontologists were the profuse impressions of calcareous marine fossils from which the original shells had dissolved. Close examination of the limestone offered proof that the entire formation owed its origin to the shells contributed by numerous kinds of these animals.

Dr. H. S. Booth of Western Reserve University, obtained more than a hundred pounds of fine material which will be used for display at the university and for examination in the laboratories.

The party returned to Cleveland amply rewarded and well pleased with the trip.

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1 Plain St. **Clinton, Mass.**

A "PAR MINE" IN MAINE

By KAARINA BJAREBY

There was one more quarry to visit that day, so we kept driving along a bumpy dirt road until we came to a small farm. No one was at home but we were not surprised as during our altogether too short a vacation in Greenwood, Maine, we had observed that the folks often left their farms for a day to work in their small 'mines' up in the hills.

It was easy to find the quarry by following the road which glittered with crushed feldspar and mica. No truck had ever gone up the rest of the road which narrowed into a steep path, slippery with mud. After an exciting climb we heard the welcome sound of clanking hammers and presently were at the quarry. A big, powerful looking horse, hitched to a sled, was the first sign of life we saw. Then a rather old-looking man and an equally old-looking woman, cracking up the feldspar and loading it on the sled, were spied.

Thus we met Mr. and Mrs. Tamminen, one of the many Finnish couples who came to Maine long ago and who manage to eke out a living off the rocky farmland where the Yankees had either failed or merely abandoned it in search of better homesteads. The Finnish people stayed on stubbornly, tilling the soil and keeping their old customs and language.

The Tamminens were very typical of these people. Although Mr. Tamminen did speak some English, I, knowing their language, made the necessary introductions and explanations in Finnish to put them at ease. They became interested at once, told us to look everything over and to take anything we found.

While the old farmer was showing my husband the quarry, I sat on the sled talking with the wife, and obtained much interesting information. They had lived in Maine for over thirty years but only recently started working a quarry—like so many of their neighbors—to add to their meagre income from farming.

"Isn't it awfully hard for you to climb up here?" I asked her.

She smiled. "Well, it's apt to take my breath away for a while but I don't do it so often. I usually come here at noon with his lunch. Then I work up here while he takes down the loads to the road where a truck hauls it away. It is hard on him though; he makes many trips a day."

"But you help him with all the drilling and cracking too," I insisted.

"The drilling is nothing," she laughed, "I only hold the drill while he hammers on it—the cracking—I'm used to that now."

I looked at her sinewy brown hands and remembering how I was afraid of breaking even one of my fingernails, I immediately felt rather sheepish.

After a while the men came back. Not much was found that was not already in our collection except a very good specimen of black tourmaline, a hexagonal crystal of muscovite and some rose quartz. We were directed to another newly opened quarry a quarter of a mile further in the woods where we found several very good specimens of twinned and terminated beryl crystals.

Back at Tamminen's quarry, we found the old couple busy as ever. When we showed them our beryl specimens Mr. Tamminen explained, "It is not much notin' but 'par in my mine." 'Par is the nearest the Finns could come to pronouncing 'feldspar.' " 'Tis number two'par," he pointed to a small heap, "'Tis good 'par. 'Tis number two 'par—not so good," pointing to another heap. "Sometime I lucky, find plenty good 'par—make more money." Then showing us a bucketful of broken beryls, not very good for a collection but to him they

seemingly meant a lot, he said, "'Tis good stone—twenty-five dollars ton—not find much here."

Even if they did not find much beryl, they would keep on toiling in the fields, doing their chores, and whenever there was time they would climb up to work in their quarry sorting out number one and number two 'par and hoarding the small heap of beryl never knowing what the next blasting would uncover.

After taking a snapshot we left them, having their promise that whatever "queer" looking stones they would find would be kept for us when we return next year. The sound of their hammers grew weaker as we descended to the road. As for the minerals, we had not found very much this time but we had found something else, a new kind of life, the life of a primitive miner. We visited several quarries afterwards, big quarries that were operated more efficiently, but Tamminen's 'par mine in all its primitive simplicity left one of the most treasured memories in our minds.

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MINERAL DEVELOPMENT IN SOVIET RUSSIA

E. VAN AMRINGE, Pasadena Junior College

With the second five-year plan well under way, the Soviet government is reaping the benefits of decentralization of the old mining trust, reduction of bureaucracy and red-tape, and the encouragement of individual initiative among its engineers. Half of the Union is now geologically studied, and 850 geological and exploration parties are in the field, mainly in the Ural, Caucasus and Altai mountain ranges, Central Asia and the Far East.

Soviet gold production in 1935 was nearly six million ounces, an increase of 40% over the preceding year. One hundred thousand government grubstaked prospectors are now exploring the rich placer areas in central and eastern Asia, and four hundred thousand miners are actually at work. By 1939 production is expected to reach eleven million ounces, the great hope being to exceed the South African Rand. In 1935 nearly a quarter of a million ounces for the United States was shipped as ore via the Trans-Siberian Railroad to Leningrad and thence by boat through the Panama Canal to smelters at Tacoma, Washington. However, cheap hydro-electric power is available, and much of the ore will be milled in Siberia in the future. Activity is expected in the Pamirs, the Salyugen and Saian Mountains on the Mongolian frontier, and in the Yablonovi Mountains east of Lake Baikal. Here great granitic batholiths, intruded by pegmatite, aplite and other dikes, contain veins of gold quartz associated with silver, copper, lead and arsenic.

The Union leads the world in chromite, manganese and magnesite. It is second in petroleum, and third in coke manufacture, and the main source of our imported anthracite. Much lignite and peat moss is also produced. Important rich copper deposits occur in Permo-Carboniferous sandstones in great geosynclinal basins in the central part of Kazakstan (Turkestan) and in the Khirgiz Steppes between the Urals and the Altais. Porphyry copper is mined near Tashkent and Lake Balkash in Turkestan, in the middle Volga region and in the Ural and Caucasus Mountains. Native copper in basic lavas associated with zeolites, opal, chalcedony, calcite, epidote and prehnite is found in the Transbaikalian provinces. The Soviet copper reserves are estimated at over seventeen billion tons.

The famous platinum placers of the Urals have often been described. The metal is found intergrown with pyroxene, olivine and serpentine, and occurs in Paleozoic peridotites. The tailings contain 40% olivine, 50% serpentine and 10% magnetite and chromite, and, admixed with clay and chromite, find many refractory uses. Uranium, vanadium, and radium are extracted from the mineral tyuyamunite found in Turkestan and from other ores in the Caucasus. Zinc, lead and cadmium production comes mainly from the Kara-tau Mountains of Turkestan, in replacement depsits in Devonian and Carboniferous limestone. Other producing areas are north of Vladivostok and in the western Altai. Nickel is mined in the Urals, the Kola Peninsula in Karelia and on the Yenisei River in Siberia. A small tonnage of ttanium dioxide pigment is prepared from ilmenite from the Miask district in the Urals, the famous amazonite locality.

The Alibert mine near Irkutsk is perhaps the best known producer of pencil graphite, which occurs in a nepheline-syenite close to the contact of a graphitic schist. Over a million tons of high grade fluorite have been located on the shores of the Kara Sea, and aluminum production has been greatly stimulated with the discovery of a large deposit of bauxite in the Urals. Plans are also underway to utilize a vast tonnage of

(Continued Page 247)

R. & M. A. Outing in Southern California

E. V. Van Amringe, Director

The 5th National Outing of the Rocks and Minerals Association held in southern California by the Mineralogical Society of Southern California on Sunday, May 16th (one week earlier than regular event) was a most successful one. It was attended by 120 collectors in 35 cars. Fine graphic granite, schorl, feldspar, mica, garnet and beryl were obtained from the pegmatite of Juniper Flat, Riverside Co. After luncheon at Juniper Spring, the group proceeded to the Hemet Magnesite Mine near Winchester. The magnesite, associated with tremolite, enstatite and other undetermined secondary magnesian minerals occurs in a wide band of serpentine intruded into ancient schists and gneisses. Excellent samples were readily obtainable. A few of the party stopped at Riverside, on their return, for vonsenite.

R. & M. A. Outing In Maryland

Directors—A. Llewellyn Jones and W. E. Price

Due to college duties, the scheduled date was inconvenient for the Maryland outing and so the event was set back to Sunday, June 6th. On this day a party left Baltimore at 10:00 a. m., weather very good, and the following localities visited and minerals collected:

Blue Mount Trap Quarry, Blue Mount, Baltimore Co. In serpentized gabbro: Brucite, aragonite xls, hydromagnesite crusts, deweylite and serpentine in many varieties.

Campbell Quarry, Texas, Baltimore Co. In marble; Wernerite in gray and purple xls, calcite and quartz xls, fluorite, titanite, sphalerite, phlogopite, brown tourmaline, and pyrite.

McMahon Quarry, near Bare Hills, Baltimore Co. In marble: Brown tourmaline, rutile, chalcopyrite, pyrrhotite, limonite psuedomorph after pyrite, pyrite, phlogopite, feldspar, muscovite, and black tourmaline.

The outing was a most enjoyable one.

MINERAL DEVELOPMENT IN SOVIET RUSSIA

(continued from page 246)

nepheline-syenite in the Kola Peninsula to produce phosphoric acid, and potash as well as aluminum. Thirty-six thousand metric tons of chrysotile were reported mined in 1934 from the Urals and 18% of our imported asbestos came from this locality. Other mineral products of importance are refractory clays, sulfur, pyrite, apatite, tin, mercury, bismuth iron, sodium sulfate and potash, over ten billion tons of the latter being available from the Solikamsk deposits alone.

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SLICING OF STONE

Edited by H. L. PERDIUE

This is the first of a series of articles written by John Vlismas, located in New York City, a professional stone craftsman with 20 years' experience.

Many of us have looked at a stone and wished we could take a nice smooth slice right through the center of it. We know that this is not easy. Our ancesters discovered this many years ago and have spent years and years of toil in cutting and shaping stone. In this article I want to describe the various ways of slicing stone, and give the merits of each practice.

There are six ways in which stone is commonly cut today: gang saw, wire saw, mud disc, diamond wheel, diamond charged disc and carborundum saw.

Gang Saw:—This is probably the oldest power operated method. The machine consists of one or more metal blades mounted side by side, and made to oscillate back and forth very much like a power driven hack saw.

Abrasives made liquid by adding water are then fed to the blades as they move back and forth over the stone to be cut. The marble industry employs this method using sand and water as the abrasive. In the granite industry steel shot or steel abrasive, and water are used. In cutting agate a harder abrasive such as carborundum and water must be used.

Wire Saw:—This consists of a twisted pair of steel wires driven over two power operated pulleys. The twisted wires allow the abrasive to produce a boring action, as they carry the abrasive over the stone. The same abrasives are used with this machine as mentioned above.

Both of these methods have been used extensively and reliably, especially in the heavier stone industries. They are too slow, however, for a modern craftsman who must get rapid production and compete with low paid foreign labor.

Mud Disc:—The theory of this scheme is the same as the two mentioned above except that a thin steel disc carries the abrasive particles to the work and allows them to cut through where desired. This scheme consists of one or more discs made to rotate in a vertical plane. The discs are sometimes made of the softer metals, but a soft tough steel such as Russian steel or Chrome steel is preferable. This method is fully described in Howard's Handbook, including the method of holding and feeding the stone.

Some machines instead of having the revolving wheel mounted stationary and the stone fed to it, operate in the reverse order. In this case the disc or discs are mounted on a movable guide table. The stone is held stationary and the rotating discs are forced into the stone, while the abrasive is picked up in the usual manner.

The mud discs method is also quite successful. To be used on a large commercial scale, such a machine is very expensive. The writer knows of one shop using this type of machine that can slice about three tons of agate a month. The machine is costly, requires considerable horsepower to operate and is rather slow. For the amateur, this method is practical, but slow.

Diamond Saw:—To use this method one must have a disc made up with holes spaced around the circumference at about ½ inch intervals. A diamond is set in each hole. One can readily see that such a saw 10 inches in diameter would have approximately 60 diamonds in it. The cost of the diamonds, plus the labor of drilling and mounting runs the overall cost of this saw up to a price that is prohibitive for the ordinary operator. Although the saw works satisfactorily it is not easily used and if diamonds are broken off it is expensive and difficult to repair.

Diamond Charged Disc: — Here a soft thin steel wheel is charged with diamond dust. This is accomplished by first knurling the edge and then applying a mixture of diamond dust and olive oil to the crevices created. The disc is then turned slowly by hand and a piece of agate held against the edge. This traps the diamond particles into the edge and makes a saw which is quite satisfactory. One concern in Boston hammers the diamond dust in the edge of the disc and then corrugates the edge. This is a good saw and is used by the best lapidaries. In order to make a saw one must be quite expert to distribute the charge thru-out the entire cutting edge. In using the saw, if it is not operated at the proper speed, and if the work is fed in too fast the charge may be lost and the wheel spoiled. This means recharging which is somewhat laborious and in general not very satisfactory.

Here again this wheel has been used with success, but is not recommended for those who want to consistently cut stone, especially beginners.

Carborundum* Saw: — The writer believes this is the most practical method of cutting stone from both an amateur and commercial standpoint. Although somewhat difficult, anyone with any skill at all can slice from the very beginning. It is advisable to proceed slowly until one becomes familiar with the fundamentals.

There are three factors essential to successful work with the Carborundum saw: Proper selection of the wheel, proper type of machine, and proper holding and feeding of the work.

In selecting a cutting wheel one must consider both the hardness and toughness of the material he is going to cut. As a rule very hard dense materials require a relatively soft grade of grinding wheel. Hard materials resist the penetration of the abrasive grains and cause them to dull quickly. Softer grades enable the worn, dull grains on the edge of the wheel to break away and expose new sharp grains.

Selecting the Wheel.

To obtain the proper wheel one must consider the five variables which make up the construction of the wheel. These are as follows:

1. Kind of abrasive.
2. Size of grain.
3. Grade of hardness (bond strength).
4. Structure.
5. Bond.

Kind of Abrasive:—Aluminum oxide in a crystalline state and silicon carbide are the abrasives in one form or another used in making most grinding wheels.

Both are made in electric furnaces at Niagara Falls, the first coming from Bauxite, mined in Arkansas, and the

second from pure silica sand and coke.

Size of Grain:—The size of grain varies from 8 to 600. This means in size 8, that the particles will pass through a screen with eight openings per lineal inch, 64 per square inch. Size 600 will pass through 600 openings per lineal inch or 3,600 per square inch. There are many sizes of grain between these two limits.

Grade:—The grade of the wheel specifies the strength of the tiny posts which hold each grain in place. If these posts are strong and capable of holding the grains against considerable force tending to pry them loose, the wheel is said to be of a hard grade. On the other hand if only a small force is needed to release the grain the wheel is said to be of soft grade.

Structure:—The fourth element in a grinding wheel, after abrasive, grain, and grade, is grain spacing. The word "structure" is used to indicate this abrasive spacing. It does not designate the porosity of a wheel, for obviously, two wheels may contain the same total volume of pores, but in one the pores may be large in size and few in number, while in the other the pores may be small in size and many in number. In the first wheel the grain spacing would be wide, while in the second it would be more dense.

Bond:—By the term bond, is meant the material in the grinding wheel which attaches each grain of abrasive to its neighbor. Bond is not an abrasive, it is a holder to support the abrasive grains while they grind. There are several kinds of bonds such as Vitrified, Silicate, Bakelite, Rubber, Shellac and some others.

One can readily see that with 10 or 12 kinds of abrasive, a multitude of grain sizes, several grades of wheels, numerous grains spacings and half a dozen kinds of bonds that it is not a simple matter to select a cutoff wheel for cutting stone. In fact the manufacturers themselves have difficulty in recommending wheels for jobs not generally used in factory production. I have made hundreds of tests in trying ot determine the best wheel to use for cutting various kinds of stone rapidly and economically. I have chosen two particular wheels which in my work have given the best results.

Proper Type Machine.

To select the proper type of machine one must consider the power required to drive the saw, accuracy of cutting, and safety.

There are very few stone craftsmen in the country so there has been practically no incentive for a machinery manufacturer to develop a small machine for commercial stone cutting purposes. It has been left to the individual craftsman to develop his own working tools. In doing this I have worked out a small machine which is quite satisfactory for both commercial and amateur use.

The first consideration in designing such a machine is to make it possible to fabricate items wth a small amount of power and yet do it rapidly. To cut a square inch of agate in two minutes seems unbelievable to most people, but I do this regularly with only a one-quarter horse power motor.

The saw runs in a horizontal plane similar to a lapidary wheel. The spindle on which the saw is mounted must be of hard steel. To cut accurately it must run true and smoothly. A bronze bushing at the top with an agate thrust bearing at the bottom accomplishes this. This also keeps friction to a minimum, reduces wear, thus increasing the life very materially. The spindle must be adjustable up and down to slice accurately. A smooth level surface must be provided on which to feed in the work. Provisions must be made so that none of the abrasive particles can get into the bearings. Speed adjustment must be obtained. All of these things have

been incorporated into a small compact machine capable of cutting any stone and up to hardness of 9. I am using this machine daily for my regular work in producing boxes, frames, spheres, inlays and other works of art as the trade may require. I can cut pieces up to six inches square and have cut hundreds of pieces only a few thousands of an inch thick for micro-mounts.

In using a 1-16 to 1-64 inch cut-off wheel one must be sure that if it breaks (and they do) that the particles will not in any way injure the operator. By running the wheel as I do, that is, in a horizontal plane, the broken pieces will only fly against the side of the table in case it shatters and will do no harm. It is perfectly safe. Several women and boys have used my machine and I have never had a casualty.

To cut a particular specimen it should first be cast into plaster of Paris at the proper position for taking the slice where desired. The wheel is started and usually run at 1750 r. p. m. The work is then placed before the wheel on a smooth even surface of marble or other material. With a stream of water running on the wheel, the work is first gently pushed into the wheel. By the feel one can tell how much is being cut at a time. The work is then turned first to the left then gradually to the right as it is pushed into the cutting edge of the wheel. By turning the work first one way then the other very slowly as it is fed to the wheel two things take place. You cut smaller surfaces at a time and you allow the particles of the stone removed to be washed or thrown out so that the wheel will not clog. The temperature at the point of cutting is kept down so the wheel will not overheat and deteriorate.

As mentioned above almost anybody can cut stone from the beginning. The main thing to remember is not to expect too much speed at first. The work must be held firmly and absolutely level. The wheels will withstand considerable edgewise pressure, but a slight upward deviation may break the wheel.

I want to point out again that this is the simplest, quickest, and most safe method of cutting stone, and you can do it the first time you try.

If you are in New York, call on me. I am using this method continually and will be glad to demonstrate how easily you can cut stone and bring out the beauties which otherwise would be missed.

*The word Carborundum is used here as a common name for abrasives throughout the industry. The Carborundum Company, the Norton Company and others make similar abrasives under their own trade names.

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Queens Long Island Mineral Society

Another youngster has been born on Long Island when the Queens Long Island Mineral Society was recently organized. It is already waxing fat and strong and prospects for a healthy growth are very good.

The 5th meeting of the new club was held in the recreation hall at the home of Mr. and Mrs. John A. Grenzig, 219 Lincoln Avenue, Brooklyn, N. Y., on Thursday, June 17th. Although it was a very stormy night, 27 members and friends were in attendance; 4 new member applications were received and accepted.

The subjects of the evening were Micro Mineral Box Mounts demonstrated by Mr. Grenzig) and Rock Section Preparation (demonstrated by Messrs. Peter Thein and George Ashby).

Mr. E. A. Maynard of Jamaica, L. I., who had but recently returned from a six months' sojourn in Florida, exhibited the finest lot of chalcedony pseudomorphs after coral from Tampa Bay, Fla., ever seen around New York. Mrs. S. F. De Remer, instructor in natural sciences, gave a brief talk to an enthusiastic group.

Miss Bernadette Reis, 10314 97th Avenue, Ozone Park, L. I., N. Y., is secretary of the new society.

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